

What is claimed is:

1. A protection device comprising:

a switch having an input terminal and an output terminal, the output terminal for connection to a terminal of a rechargeable battery to be charged, the switch preventing current to flow from its input terminal to the output terminal and into the rechargeable battery when it is opened; and

a switch protection circuit comprising a zener diode and a thermal resistor connected in series, the switch protection circuit for connection in parallel with output terminals of a battery charger, the zener diode being thermally coupled to the thermal resistor and a cathode of the zener diode being connected to the input terminal of the switch;

wherein the zener diode protects the switch from overvoltage conditions by shunting current away from the switch, and the thermal resistor protects the zener diode from overtemperature conditions by entering a high impedance state to effectively disconnect current from the battery charger when the temperature of the zener diode exceeds a predetermined threshold.

2. The protection device of claim 1, wherein the thermal resistor is a non-linear positive coefficient temperature sensitive resistor having a low resistance at normal temperatures and having a high resistance at higher temperatures to effectively open circuit current flow therethrough.

3. The protection device of claim 1, wherein the zener diode and the thermal resistor are combined in a single integrated circuit package.

4. A rechargeable battery comprising the protection device of claim 1 integrated therewith.
5. The protection device of claim 1, and further comprising a heat spreader for thermally coupling the thermal resistor to the zener diode.
6. The protection device of claim 5, wherein the zener diode comprises a semiconductor die layer and first and second metalization layers disposed around the semiconductor die layer, the thermal resistor comprises a resistor element layer and a conductive layer, wherein the zener diode and the thermal resistor are attached to the heat spreader so that the resistor element layer of the thermal resistor is in contact with the heat spreader.
7. The protection device of claim 1, wherein the switch is a field effect transistor (FET) switch comprising a source terminal, drain terminal and gate terminal, the source terminal corresponding to the input terminal of the switch and the drain terminal corresponding to the output terminal of the switch.
8. The protection device of claim 7, and further comprising an overcharge protection control circuit coupled to the gate terminal of the FET switch to control whether the FET switch is open or closed in response to charging conditions of the rechargeable battery.
9. A switch protection circuit for protecting a switch having an input terminal and an output terminal, the output terminal of the switch being coupled to a rechargeable battery that is to be protected, the switch protection circuit for connection across output terminals of a battery charger, the switch protection circuit comprising:
a zener diode and a thermal resistor connected in series, the

zener diode being thermally coupled to the thermal resistor, the cathode of the zener diode being connected to an input terminal of the switch;

wherein the zener diode protects the switch from overvoltage conditions by shunting current away from the switch, and the thermal resistor protects the zener diode from overtemperature conditions by entering a high impedance state to effectively disconnect current from a battery charger when the temperature of the zener diode exceeds a predetermined threshold.

10. The switch protection circuit of claim 9, wherein the thermal resistor is a non-linear positive coefficient temperature sensitive resistor having a low resistance at normal temperatures and having a high resistance at higher temperatures to effectively open circuit current flow therethrough.

11. The switch protection circuit of claim 9, wherein the zener diode and the thermal resistor are combined in a single integrated circuit package.

12. The switch protection circuit of claim 9, and further comprising a heat spreader for thermally coupling the thermal resistor to the zener diode.

13. The switch protection device of claim 12, wherein the zener diode comprises a semiconductor die layer and first and second metalization layers disposed around the semiconductor die layer, the thermal resistor comprises a resistor element layer and a conductive layer, wherein the zener diode and the thermal resistor are attached to the heat spreader so that the resistor element layer of the thermal resistor is in contact with the heat spreader.

14. A protection device comprising:

a switch having an input terminal and an output terminal,

the output terminal for connection to a terminal of a device which is to be protected, the switch preventing current to flow from its input terminal to the output terminal and into the device when it is opened; and

a switch protection circuit comprising a zener diode and a thermal resistor connected in series, the switch protection circuit for connection in parallel with terminals of a power supply, the zener diode being thermally coupled to the thermal resistor and a cathode of the zener diode being connected to the input terminal of the switch;

wherein the zener diode protects the switch from overvoltage conditions by shunting current away from the switch, and the thermal resistor protects the zener diode from overtemperature conditions by entering a high impedance state to effectively disconnect current from the power source when the temperature of the zener diode exceeds a predetermined threshold.

15. The protection device of claim 14, wherein the thermal resistor is a non-linear positive coefficient temperature sensitive resistor having a low resistance at normal temperatures and having a high resistance at higher temperatures to effectively open circuit current flow therethrough.

16. The protection device of claim 14, wherein the zener diode and the thermal resistor are combined in a single integrated circuit package.

17. The protection device of claim 14, and further comprising a heat spreader for thermally coupling the thermal resistor to the zener diode.

18. The protection device of claim 17, wherein the zener diode comprises a semiconductor die layer and first and second metalization layers disposed

around the semiconductor die layer, the thermal resistor comprises a resistor element layer and a conductive layer, wherein the zener diode and the thermal resistor are attached to the heat spreader so that the resistor element layer of the thermal resistor is in contact with the heat spreader.

19. The protection device of claim 14, wherein the switch is a field effect transistor (FET) switch comprising a source terminal, drain terminal and gate terminal, the source terminal corresponding to the input terminal of the switch and the drain terminal corresponding to the output terminal of the switch.